DETAILED ACTION

Claim Objections

1. Claims 1, 6-7 and 9 are objected to because of the following informalities:

Consider claim 1: Claim 1 is objected to due to the claim reciting that the at least one layer of mixed oxides is "made of" zinc oxide and titanium oxide and at least one additional oxide. The terminology "made of" is interpreted as a process and as it is written it can mean that the mixed oxide layer could be made of those materials but those materials do not necessarily have to be in the final product. This terminology should be changed to "comprising" if the materials are present in the final product.

Consider claims 6-7: Claims 6 and 7 are objected to due to the claims reciting that one or more functional layers is "made of" silver. The terminology "made of" is interpreted as a process and as it is written it can mean that the functional layer could be made of silver but silver does not necessarily have to be in the final product. This terminology should be changed to "comprising" if the materials are present in the final product.

Consider claim 9: Claim 9 is objected to due to the percent range of Zn not being written in the same manner consistent with the other percent ranges present in the claim. Rather than 90 to 40% as it is presently written, it should be changed to 40 to 90% to be consistent with the percentages in the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 3 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Consider claim 3: Claim 3 claims the ZnO and TiO_2 being present in the layer of mixed oxides of claim 2 "essentially" in molar ratios of 1:1 or 2:1. This claim is indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention due to it being unclear what "essentially" means.

For the purposes of applying prior art the examiner interprets the claim to mean that the ZnO and TiO_2 may be present in the mixed oxide layer in molar ratios of 1:1 or 2:1 but does not necessarily have to.

Consider claim 8: Claim 8 claims the multilayer system as claimed in claim 1 comprising a structure as follows: Substrate-SnO_2-ZnO-Ag-CrNi-SnO_2-Zn_2TiO_4:Al.

The claim limits the multilayer system of claim 1, which claims at least one functional layer and at least one mixed oxide layer being present. While this claim is meant to be a limitation of claim 1, it is unclear as to what material in claim 8 is the functional layer mentioned in claim 1.

Even further, there is insufficient antecedent basis for this claim. Claim 8 recites the limitation of the multilayer system as claimed in claim 1 comprising a structure that is comprised of the materials, SnO_2, Ag, CrNi, and Zn2TiO4:Al. The examiner notes that a structure and the above materials are not mentioned in claim 1 and due to the claim

being written as "comprising" and not "further comprising", the claim lacks antecedent basis.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-14 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The reference to a "system" for transparent substrates is non-statutory subject matter since it is unclear to what specific statutory class of invention the claims would fall.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 12-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Zagdoun (US Patent No. 5342676).

Zagdoun teaches a multilayer coating comprised of a functional film (abstract) and an intermediate film (Col. 3, lines 61-63) wherein the intermediate film is comprised of mixed oxides. The mixed oxide film is comprised of titanium oxide, zinc oxide, and aluminum oxide (Col. 4, lines 1-10). The multilayer can be coated on a transparent

glass substrate (Col. 1, lines 28-39, title) by reactive sputtering from a metal target alloy (Col. 5, lines 6-13) **(Claims 1 & 12)**.

The examiner notes that claim 1 is a product-by-process claim and according to the MPEP 2113 [R-1], product-by-process claims may be limited by and defined by the process but the determination of patentability is based on the product itself. Therefore, the patentability of a product does not depend on its method of production and if the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. In the instant case, the prior art teaches the same product and method of production.

The reference further teaches that the transparent substrate with the multilayer coating is a glass substrate used for glazing (Col. 1, lines 26-34). (Claim 13) Furthermore, another glazing can be coated on the glass glazing substrate with the multilayer coated thereon (Col. 1, lines 35-40). **(Claims 13 & 14)**

Claim Rejections - 35 USC § 102/103

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 5 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Zagdoun (US Patent No. 5342676).

As discussed above, Zagdoun teaches a multilayer comprised of a layer comprising zinc oxide, titanium oxide, and aluminum oxide and a functional layer. Also as previously discussed, reactive sputtering with a metal target alloy forms the layers and the multilayer is for coating on a transparent substrate. Furthermore, the reference teaches that the mixed oxide layer has an optical thickness of preferably 50 to 100nm (Col. 3, lines 45-51). This would fall within the physical thickness range of applicants' claim 5.

In the alternative, the examiner notes that optical thickness is dependent on wavelength and that the thickness of a layer is a result effective variable. It is known that by adjusting the thickness of the layer, optical properties and physical characteristics will also change. Through routine experimentation the desired optical properties of the article can be achieved by optimizing the thickness of the layers. Therefore, it would have been obvious to one of ordinary skill in the art to optimize the optical thickness of the prior art by changing the wavelength in order for the physical thickness of the layer to fall within the applicants' range.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made

to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 2-4, 6-7 and 9-11 are rejected under 35 U.S.C. 103(a) as being obvious over Zagdoun (US Patent No. 5342676) in view of Nagashima et al. (US Patent No. 6468934).

As discussed above, Zagdoun teaches a multilayer comprised of a layer comprising zinc oxide, titanium oxide, and aluminum oxide and a functional layer. Also as previously discussed, reactive sputtering with a metal target alloy forms the layers and the multilayer is for coating on a transparent substrate. Zagdoun also teaches that the mixed oxides in the mixed oxide intermediate layer attenuate reflection (Col. 3, lines 1-5) and that zinc, aluminum and titanium regulate the refractive index in the layer (Col. 4, lines 1-10). However, Zagdoun is **silent with regard to the zinc oxide and titanium oxide being present in the mixed oxide layer in a molar ratio of the order of 1:1 to/or 2:1, the additional oxide being present in the mixed oxide layer from 0.5% to 8%, and the metal target alloy having the composition of claims 9-11.**

Consider claims 2-4: Nagashima et al. teach a multilayer coating for transparent substrates such as glass (Col. 3, lines 40-51). The reference discloses that the substrates can have multiple layers such as an oxide layer comprised of titanium oxide, zinc oxide, and aluminum oxide (Col. 9, lines 18-29) that controls color tone and reflection (Col. 7, lines 5-10). The reference further discloses that the structure can be formed using a sputtering technique with a metallic target (Col. 2, lines 1-5) and that titanium oxide is present in the mixed oxide layer at 0 to 30% (Col. 7, lines 7-16), zinc

oxide is present from 0 to 15% (Col. 9, lines 25-29) and aluminum oxide is present in the layer at 0 to 30% (Col. 6, lines 50-52). Due to both zinc oxide and titanium oxide being able to be present at 15%, this would correspond to a 1:1 molar ratio of the entire layer.

Zagdoun and Nagashima et al. disclose analogous inventions related to multi-layers on transparent glass substrates wherein the multi-layer is comprised of a mixed oxide layer comprised of titanium oxide, zinc oxide, and aluminum oxide. As such, it would have been obvious to one of ordinary skill in the art at the time of invention to modify the multilayer of Zagdoun to include the material, such as 0 to 30% aluminum oxide and titanium oxide and 0 to 15% zinc oxide, of Nagashima et al. in the mixed oxide layer in order to better control color tone and reflection of the glass substrate.

Consider claims 9-11: Furthermore, Nagashima et al. teach that while zinc oxide, titanium oxide and aluminum oxide control color tone with the above percentages, color tone can be altered depending on the index of refraction of the coating (Col. 6, lines 38-44). This is related to Zagdoun's teaching due to Zagdoun disclosing that zinc, aluminum and titanium regulate refractive index in the coating layer as mentioned above. The examiner notes that the percent composition of an alloy coating is a result effective variable. It is known that by adjusting the percentages of the coating, optical properties and physical characteristics will also change such as refractive index and color tone. Through routine experimentation the desired optical properties of the article can be achieved by optimizing the percentages of the zinc, titanium, and aluminum in the alloy coating.

Nagashima et al. teaching the above percentages of the metal target alloy coating to control red color tone while they also disclose that it can be altered depending on refractive index and Zagdoun teaching that refractive index is regulated using zinc, titanium and aluminum shows that depending on the color tone and refractive index properties needed, one could alter the amount of zinc, titanium and aluminum in the coating. Therefore, it would have been obvious to one of ordinary skill in the art to modify Zagdoun's teaching to include that the applicants' claimed percentages could be used in the coating to alter the refractive index and color tone to achieve desired optical and physical characteristics.

Claims 6-7 are rejected under 35 U.S.C. 103(a) as being obvious over Zagdoun (US Patent No. 5342676) in view of Arbab et al. (US Patent No. 6398925).

As discussed above, Zagdoun teaches a multilayer comprised of a layer comprising zinc oxide, titanium oxide, and aluminum oxide and a functional layer. Also as previously discussed, reactive sputtering with a metal target alloy forms the layers and the multilayer is for coating on a transparent substrate. Zagdoun further teaches that the material in the functional layer is of metallic nature (Col. 1, lines 40-45) and is a low emissive film that gives the glass substrate infrared emission (Col. 1, lines 28-30). However, Zagdoun is **silent with regard to the multilayered structure being comprised of a functional layer of silver.**

Consider claims 6 and 7: Arbab et al. teach a multilayer coating on a substrate (abstract) wherein the coating is low emission (title). They further teach that the multilayer coating is comprised of a layer of silver, which causes infrared reflectance

(abstract) and is low emissive (Col. 7, lines 59-62) and layers of mixed oxides comprising zinc oxide, titanium oxide, etc (Col. 6, lines 44-60). Furthermore, they disclose that the multilayer is coated on a glass substrate (Col. 4, lines 7-10).

Zagdoun and Arbab et al. disclose analogous inventions related to a multilayer comprised of a low emissive (functional) metallic layer which reflects/emits infrared light and a mixed oxide layer wherein the multilayer is coated on a glass substrate. As such, it would have been obvious to one having ordinary skill in the art at the time of invention to modify the glass coated structure of Zagdoun to include the silver metallic layer of Arbab et al. as the functional metallic layer within the multilayer coating.

Claim 8 is rejected under 35 U.S.C. 103(a) as being obvious over Zagdoun (US Patent No. 5342676) in view of Schicht (US Patent No. 6159621) in further view of Arbab et al. (US Patent No. 6398925).

As discussed above, Zagdoun teaches a multilayer comprised of a layer comprising zinc oxide, titanium oxide, and aluminum oxide and a functional layer. Also as previously discussed, reactive sputtering with a metal target alloy forms the layers and the multilayer is for coating on a transparent substrate. Zagdoun further teaches that the material in the functional layer is of metallic nature (Col. 1, lines 40-45) and is a low emissive film that gives the glass substrate infrared emission (Col. 1, lines 28-30). However, Zagdoun is **silent with regard to the multilayered structure having the layers of silver, chromium-nickel (nichrome) and aluminum doped zinc-titanium oxide compound being present and the layers in the order as claimed in claim 8.**

Regarding the aluminum dopes zinc-titanium oxide compound being present and the layers in the order as claimed in claim 8

Schicht et al teach a multilayer coating for transparent substrates (Col. 1, lines 5-15). They also teach that the structure can be as followed: **substrate – tin oxide- zinc oxide- silver**- titanium- zinc oxide- **tin oxide- zinc oxide- and titanium oxide** (Col. 3, lines 1-5). The titanium deposited on the silver is a metallic protective film for the silver (Col. 2, lines 50-55). Furthermore, they teach that a barrier (outer) layer can be formed such as that of Zn_2TiO_4 (combination of the last zinc oxide and titanium oxide) in order to create high chemical stability (Col. 2, lines 5-40) and that aluminum can be added to ZnO films (such as the barrier film) (Claim 1), which is known in the art to aid in sputtering applications.

Zagdoun and Schicht et al. disclose analogous inventions related to a multilayer coating for transparent substrates comprised of a metallic functional layer and metal oxide layers comprised of zinc oxide, titanium oxide, tin oxide and aluminum formed on the substrate by sputtering (Schmidt, Col. 2, lines 15-18). As such, it would have been obvious to one of ordinary skill in the art at the time of invention to modify the multilayer of Zagdoun to include the layered structure sequence of Schicht et al, **substrate – tin oxide- zinc oxide- silver**- titanium protective film- zinc oxide- **tin oxide** and a barrier layer of Zn_2TiO_4 that can be doped with aluminum, as the multilayered structure in order to increase chemical stability, wet ability and bonding of the layers (Col. 2, lines 5-25).

Regarding chromium-nickel (nichrome) layer being present

As discussed above, Arbab et al. also teach that the multilayered structure can be comprised of mixed oxide layer and a silver layer. They also teach that a nichrome (CrNi) layer is provided on top of the silver to protect the said silver layer (Col. 1, lines 56-60).

Zagdoun and Arbab et al. disclose analogous inventions related to a multilayer coating for transparent substrates comprised of metallic functional layers and metal oxide layers and it was determined obvious previously to modify Zagdoun's multilayer to include the layered structure of Schicht et. al.. The newly modified teaching includes a metallic layer to protect the silver layer. Due to the newly modified teaching of Zagdoun and Arbab et al. disclosing analogous inventions as mentioned above and Arbab et al. disclosing that nichrome is a suitable metallic layer to protect silver shows that it would have been obvious to one of ordinary skill in the art at the time of invention to further modify the multilayer of Zagdoun to include nichrome of Arbab et al. in the metallic protective layer in order to protect the silver.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lauren E.T. Robinson whose telephone number is (571) 270-3474. The examiner can normally be reached on Mon. through Fri. 7:30 to 5:00 EST (First Fri Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on (571) 272-1515. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

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